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Serial No. 09/535,206
Atty. Ref. 29250-000941/US

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Appeal No. _______________

Appellants:	Muralidharan S. KODIALAM et al.
Application No.:	09/535,206
Group No.:	2143
Filed:	March 27, 2000
Examiner:	A. Boutah
For:	ROUTING OF BANDWIDTH GUARANTEED PATHS WITH RESTORATION IN AN INFORMATION NETWORK

Attorney Docket No.: 29250-000941/US

BRIEF ON APPEAL ON BEHALF OF APPELLANT

BOX APPEAL
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

March 25, 2004

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BRIEF ON BEHALF OF APPELLANT

In support of the Notice of Appeal filed January 26, 2004, appealing the Examiner's final rejection mailed July 25, 2003 of each of pending claims 1-10 of the present application which appear in the attached Appendix, Appellant hereby provides the following remarks.

I. REAL PARTY IN INTEREST

The present application is assigned to Lucent Technologies Inc., by an Assignment recorded on March 27, 2000, Reel 010705, Frame 0864.

II. RELATED APPEALS AND INTERFERENCES

The Appellant does not know of any appeals or interferences which would directly affect or which would be directly affected by, or have a bearing on, the Board's decision in this Appeal.

III. STATUS OF THE CLAIMS

Claims 1-10 reproduced in the attached Appendix A are the claims on Appeal. Each of these claims is currently pending in the application.

IV. STATUS OF ANY AMENDMENTS FILED SUBSEQUENT TO THE FINAL REJECTION

An Amendment dated October 22, 2003 was filed with the U.S. Patent Office in response to the Final Rejection dated July 25, 2003, and was considered by the Examiner. However the Amendment was not entered as indicated in the Advisory Action dated November 3, 2003 because the Examiner asserted that the amendments raised new issues that required further consideration and/or search. An Amendment is being filed concurrently with this appeal brief, without claim amendments, amending the specification to address the Examiner's objection to the specification.

V. SUMMARY OF THE INVENTION

The invention relates to a technique for establishing transmission paths that meet a guaranteed bandwidth requirement in an information network, with backup or restoration in the event of an active path link failure.

In an exemplary embodiment of the invention, a method of establishing restorable paths in an information network in response to arriving traffic transmission requests includes; receiving the requests at a first node of the network for transmission of traffic to a second node, wherein a given request specifies a desired transmission bandwidth for an active path and a backup path, to be established between the first and the second nodes. Potential active and backup links in the network are identified to satisfy the active path request, wherein each of the potential active and backup links have an available bandwidth at least equal to that specified by the given request. An active and a backup path are formulated for each given request from among the potential active and backup links identified in response to a request.

According to another exemplary embodiment of the invention, partial routing information is used in determining backup paths. The additional information includes the total bandwidth used by the active paths, and, separately, the total bandwidth used by the backup paths. This incremental information is disseminated to nodes distributed over the network. The aggregate information is advantageous because it can be used in a distributed fashion. This allows for the effective sharing of backup paths using the aggregated information representing the aggregate link occupancy due to active paths, and aggregate link occupancy due to backup paths (see e.g., pages 8 and 11 of the Specification).

According to yet a further embodiment of the invention, some sharing of the backup paths is possible even though only minimal information is maintained. Let "M" represent the maximum value of active reserved bandwidth for some link (i, j) in an active path, "b" represent the bandwidth needed, and "G_{uv}" represent the total backup bandwidth reserved on a link (u,v). For a potential link (u,v) on the backup path, if $M + b <= G_{uv}$, then no additional bandwidth needs to be reserved on the backup path because any link failure on the active path generates a bandwidth need of at most M + b. If, however, $M + b > G_{uv}$ only an additional reservation of $M + b - G_{uv}$ units of bandwidth is required. If this bandwidth is not available, then this backup path is not feasible (See for example, page 21 of the Specification).

VI. ISSUES PRESENTED

i. Whether or not claims 1-10 are anticipated under 35 U.S.C. §102(b) by the article entitled "Design of a Fast Restoration Mechanism for Virtual Path-Based ATM Networks," by Chao-Ju Hou ("Hou" or "Hou article").

VII. GROUPING OF THE CLAIMS

Appellant respectfully requests, for the purposes of this Appeal, that the grouping of the claims be as follows:

Group I including claims 1-4;

Group II including claims 5, 7-10; and

Group III including claim 6.

The claims of Group I stand and fall together. The claims of Group II stand and fall together.

VIII. ARGUMENTS

a) The Objection

The Examiner has objected to the specification because it fails to include a detailed description of FIG. 6.

Appellants assert that the objection is now moot given the amendment to the specification included in an amendment filed concurrently with this appeal brief under separate cover. The amendment includes only an amendment to the specification and not to any claims. This amendment materially reduces issues presently under appeal.

b) The Rejections

The following summary of the Examiner's rejections is based on the Final Rejection, paper 10, unless otherwise noted.

The Examiner has rejected claims 1-10 under 35 U.S.C. § 102(b) as being anticipated by the Hou article.

Regarding claim 1, the Examiner alleges, among other things, that Hou teaches a method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:

receiving a request at a first node of the network for transmission of traffic to a second node of the network, wherein a given request specifies a desired transmission bandwidth for an active path and a backup path to be established between the first and the second nodes (Abstract; Introduction, 2nd-3rd paragraph; Preliminaries, 1st-2nd paragraph):

distributing information to nodes in the network concerning (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network (Preliminaries, 1st - 4th paragraph);

Regarding claim 5, the Examiner alleges Hou teaches a method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:

selecting backup links in the network to form the backup path for restoring the formed active path after the given request has arrived, by using a maximum total bandwidth reservation among the active links selected to form the active path to determine a required bandwidth reservation for each backup link selected to form the backup path (Overview of Proposed Fast Restoration Mechanism, Establishment of Backup VPs; page 364, col. 1, line 31 to col. 2, lines 12).

Regarding claim 6, the Examiner alleges Hou teaches the method of claim 5, including distributing information to nodes in the network concerning (a) total bandwidth reserved by each link in the network for all active paths currently formed in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently formed in the network.

c) Reasons Supporting the Allowability of Group I Claims

(Claims 1-4)

With regard to claim 1, Appellants assert that Hou fails to disclose, teach, or suggest the elements of claim 1 which, in pertinent part, reads as follows:

> 1. A method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:
>
> . . .
>
> distributing information to nodes in the network concerning (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network

The Examiner suggests that the above distributing step is disclosed in Hou, Section 2, Preliminaries, Paragraphs 1-4. Section 2 discloses that once each virtual path (VP) is set up by reserving bandwidth in anticipation of later call setup requests, subsequent virtual circuit (VC) setup requests can be admitted into the network, and new VCs may be established through a sequence of VPs, such that the VPs traversed have adequate bandwidth to maintain the quality of service requirement of the VC. Hou discloses that this is done by executing a simple control function at the VP terminators of each traversed VP.

Hou goes on to say that one advantage that results from the VP concept is that path restoration in the case of link/node failure can be easily realized by pre-assigning an alternate backup VP for each primary VP with appropriate bandwidth reserved (but not dedicated) on the links along which the backup VP is routed. In the case of link/node failure, path restoration for the VPs which traverse the failed link can be performed by having the destination VP terminator of the failed VP (called the sender node) send a restoration message along the backup VP path to

activate the reserved bandwidth on the links along the path and to notify the source VP terminator (called the chooser node) of the restoration operation. The chooser node then changes the VPI value in its routing table, and sends all the cells via its alternate backup VP.

Appellants assert that sending a restoration message or cells is not the same as distributing, to nodes in the network, information concerning: (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network; and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network, as recited in claim 1. A1

Further, Appellants assert that where Hou discloses the establishment of backup VPs, there is no disclosure of distributing information to nodes in a network related to bandwidth. For example, Hou discloses a backup VP establisher that is responsible for selecting a backup VP for each primary VP and establishing a near-optimal backup layout (FIG. 1 and Sec. 3, Establishment of Backup VPs). A proposed near-optimal solution algorithm is shown in FIG. 2. The algorithm consists of two phases; phase I establishes an initial layout of backup VPs, and phase II attempts to reroute each backup VP in the given initial backup VP layout to further reduce the maximum link load and/or to establish a backup VP which cannot be set up previously. Appellants assert that the disclosure of the VP establisher and the algorithm of FIG. 2 do not disclose distributing information to nodes even though bandwidth values are discussed. A2

A distribution of a message does appear to occur in Hou, however, but not as recited in claim 1. A setup request message is disclosed in Hou that is sent including the following fields: (1) id: the VPI of the backup VP, to be relocated; (2) chooser: the chooser node, n_c, of the backup VP; (3) BW: the bandwidth requirement of the backup VP; (4) hop_count: the number

of physical links on the path traversed by a set-up request message (Req) so far; and (5) from_node: the immediate upstream node from which Req is sent/forwarded (from_node is initially set to the sender node n_s). The sender node, n_s, then forwards the message along all capable outgoing links (Section 4.2). Appellants assert that none of fields described for the setup request message disclose: (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network; and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network.

For at least the above reasons, Appellants assert that Hou fails to disclose distributing information to nodes in a network related to: (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network; and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network, as recited in claim 1. In sum, because Hou does not disclose each and every element of independent claim 1 it cannot anticipate claim 1 or its dependent claims.

With regard to the remaining Group I claims, dependent claims 2-4, Appellants assert that dependent claims 7-10 are allowable at least because they depend from allowable independent claim 1.

d) Reasons Supporting the Allowability of Group II Claims (Claims 5, 7-10)

With regard to claim 5, Appellants assert that Hou fails to disclose, teach, or suggest the elements of claim 5 which, in pertinent part, reads as follows:

> 5. A method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:
>
> . . .

> selecting backup links in the network to form the backup path for restoring the formed active path after the given request has arrived, by using a maximum total bandwidth reservation among the active links selected to form the active path to determine a required bandwidth reservation for each backup link selected to form the backup path.

Instead, Hou discloses, in FIG. 2 (showing Phase I of an algorithm), that only links with sufficient bandwidth are included in a list that contains potential backup links. A link is said to have sufficient bandwidth if:

$$C_k >= \Sigma_{\text{ek is on Pj}} B_j + B_i$$

where Ck is the capacity of link ek and "$\Sigma_{\text{ek is on Pj}} B_j+B_i$" is the link load of link ek, and B_i is an assigned bandwidth. Here, it is apparent that there is no maximum value used in determining each potential backup link. At the end of Phase I a resultant maximum link load is produced. The maximum link load is used to further refine the backup VP as disclosed in FIG. 2, Phase II. However, Appellants assert that the maximum link load of Hou is the maximum link load of a back up link and not active links. That is, Hou does not disclose using a maximum total bandwidth reservation among the active links. Therefore, Hou cannot disclose selecting backup links in the network to form a backup path for restoring the formed active path after the given request has arrived, by using a maximum total bandwidth reservation among the active links selected to form the active path to determine a required bandwidth reservation for each backup link selected to form the backup path, as recited in claim 5. In sum, because Hou does not disclose each and every element of independent claim 5 it cannot anticipate claim 5 or its dependent claims.

With regard to the remaining Group II claims, dependent claims 7-10, Appellants assert that dependent claims 7-10 are allowable at least because they depend from allowable independent claim 5.

e) Reasons Supporting the Allowability of Group III Claims (Claim 6)

With regard to claim 6, Appellants assert that Hou fails to disclose, teach, or suggest the elements of claim 6 which, in pertinent part, reads as follows:

> 6. The method of claim 5, including:
> distributing information to nodes in the network relating to (a) total bandwidth reserved by each link in the network for all active paths currently formed in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently formed in the network.

Claim 6 includes similar features as claim 1 and is allowable for at least the same reasons stated for claim 1. Appellants also assert that claim 6 is allowable because it depends from allowable independent claim 5.

IX. CONCLUSION

Accordingly, for at least the aforementioned reasons, Appellants respectfully request the Honorable Members of the Board of Patent Appeals and Interferences to reverse each of the outstanding rejections in connection with the present application and allow each of claims 1-10 to be allowed in connection with the present application.

This Appeal Brief is being presented in triplicate.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No.08-0750 for any

additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

HARNESS, DICKEY, & PIERCE, P.L.C.

By: ______________________

John E. Curtin, Reg. No. 37,602
P.O. Box 8910
Reston, Virginia 20195
(703) 668-8000

JEC/RFS:ewd

Enclosures: Three (3) copies of Appellant's Brief
Appendix -- Clean version of pending claims

APPENDIX A

1. (Previously Presented) A method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:

receiving requests at a first node of the network for transmission of traffic to a second node of the network, wherein a given request specifies a desired transmission bandwidth for an active path and a backup path to be established between the first and the second nodes;

distributing information to nodes in the network concerning (a) total bandwidth reserved by each link in the network for all active paths currently defined in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently defined in the network;

identifying potential active links in the network for an active path in response to a given request, wherein the potential active links each have an available bandwidth at least equal to the bandwidth specified by the given request;

identifying potential backup links in the network for a backup path for restoring the active path after the given request has arrived, wherein the potential backup links each have an available bandwidth at least equal to the desired transmission bandwidth specified by the given request; and

formulating an active and a backup path for each given request from among the potential active links and the potential backup links identified in response to the given request.

2. (Original) The method of claim 1, including determining the available bandwidth of a potential backup link having a certain total bandwidth capacity, by subtracting from the total bandwidth capacity (a) the total bandwidth reserved by the link for all current active paths through the link, and (b) the total bandwidth reserved by the link for all current backup paths through the link.

3. (Previously Presented) The method of claim 1, including defining each backup path in the network to be link disjoint from its corresponding active path.

4. (Previously Presented) The method of claim 1, including defining each backup path in the network to be node disjoint from its corresponding active path.

5. (Previously Presented) A method of dynamically establishing restorable paths in an information network in response to arriving traffic requests, the network having a number of nodes and links between corresponding pairs of nodes, comprising:

receiving requests at a first node of the network for transmission of traffic to a second node of the network, wherein a given request specifies a desired transmission bandwidth for an active path and a backup path to be established between the first and second nodes;

selecting active links in the network to form the active path in response to a given request, wherein the active links each have an available bandwidth corresponding to the bandwidth specified by the given request; and

selecting backup links in the network to form the backup path for restoring the formed active path after the given request has arrived, by using a maximum total bandwidth reservation among the active links selected to form the active path to determine a required bandwidth reservation for each backup link selected to form the backup path.

6. (Presently Presented) The method of claim 5, including:

distributing information to nodes in the network relating to (a) total bandwidth reserved by each link in the network for all active paths currently formed in the network, and (b) total bandwidth reserved by each link in the network for all backup paths currently formed in the network.

7. (Previously Presented) The method of claim 5, including determining if each potential backup link for the backup path to be formed is capable of accommodating the required bandwidth reservation for the active path prior to selecting the potential backup link.

8. (Previously Presented) The method of claim 7, wherein said determining step includes comparing the total bandwidth reserved by each potential backup link for all current backup paths in the network, with the required bandwidth reservation for the backup path to be formed.

9. (Previously Presented) The method of claim 5, including defining each backup path in the network to be link disjoint from its corresponding active path.

10. (Previously Presented) The method of claim 5, including defining each backup path in the network to be node disjoint from its corresponding active path.